

Operational tools for improving efficiency in wildfire risk reduction in EU landscapes

FIREfficient

Training Standards in wildfire risk planning for land and fire planners

(Tivissa, April 2015)

Contenido

1. INTRODUCTION	3
2. THE WAY AHEAD	4
3. TRAINING STANDARD IN WILDFIRE RISK PLANNING FOR FIRE AND LAND PLANNERS	6
3.1. About this training standard	7
3.1.1. General Idea	7
3.1.2. Scope	8
3.1.3. Target	8
3.1.4. Specific training standard	9
3.2. Acquisition and maintenance of this training standard	10
3.2.1. Previous skills required	10
3.2.2. Training standard achievement	12
3.2.3. Training standard maintenance	12
3.3. Training standard knowledge	12
3.3.1. General knowledge	13
3.3.2. Specific knowledge	17
3.4. Evaluated skills	20
3.4.1. What must be known and understood? (Knowledge)	20
3.4.2. What must be able to do? (Skills and abilities)	21
4. SUMMARY TABLE	22
5. REFERENCES	26
ANNEX I – Survey Pilot Sites	27

Aim

Raised Awareness of the importance of fire management issues in planning processes at both State and local government levels.

Note

The project is aware of the fact that not only the land use or landscape planning sector has to be addressed with the FIREfficient project, but also the fact that over generations, there was a growing trend on reliance on fire suppression (delivered by the state) and neglecting vegetation fuel management. It has been shown, over and over again, worldwide, to be a failed strategy.

What is needed here is a paradigm shift away from the protectionist mentality that pervades many of the current land and forest management agencies in Europe. We need a return to the sort of fire management regime used by traditional people in ages past. That means Awareness Rising and increased understanding for policy makers and landscape planners will be a core pre-requisite for the FIREfficient project.

1. INTRODUCTION

Poor Land Use Decisions Contribute to Failed Fire Management

TV reports show so many instances of houses under threat from vegetation fires. Why? Although the natural bias of the media to show human suffering is no doubt a factor, there is also no doubt that more people really are in harm's way from wildfire. The reason is the great expansion of habitation into urban fringe areas, the Wildland Urban Interface WUI. In the last 30 years considerable numbers of people have moved from traditional suburbia into "special rural" subdivisions to live "among the green trees".

Local government has usually accepted this change in land use as it has increased their rate base, and in rural districts, helped to mitigate the long term decline in rural population. However, many of these rural or semi rural settlement subdivisions are poorly designed, with little or no consideration given to fire management issues. For example, housing blocks may extend into areas of vegetation types that are well known to be highly inflammable and the source of fast-moving fires driven by strong winds. In other places we see houses constructed on steep rocky areas, or overhung by trees. These are houses that are "built to burn".

There are two difficulties with this "tree change" movement. Firstly, it has often displaced genuine farmers from that part of the landscape who were actively managing the land, including control of weeds, feral animals and fire. Secondly, they have been replaced by people with an urban background and no appreciation at all for the real requirements of land use and land management. Many of these people have a romantic view of life in the forest, and desire to be surrounded by trees and greenery. They almost invariably view fire as something to be excluded from the environment. Not only it is destructive, they believe, to nature and wildlife, but it produces that "nasty stuff, smoke".

While this is obviously not true of all new inhabitants, many of these newcomers don't really live in the country, they just sleep in it and commute off to work in the city each day, or visit their rural retreat on weekends. They often do not join the local volunteer fire brigades and seem to expect the fire service to do all the work of controlling fire in the area. Instances have been observed where the local residents were just watching the fire service controlling a fire on their own land. Even more, this attitude of "state-service" is also affecting the pre fire season work of preparedness and prevention measures.

It is time to call a halt to these irresponsible land use decisions which create a serious hazard or threat to people's lives. Further, these developments also affect safety of firefighters and resource availability. At the very least, there should be planned and built into every new settlement adequate provision for proper fire management. This has to include effective minimization of fire hazards and protection of life and property.

People who choose to live in the forest and the responsible planners must face up to the fact that vegetation fires are a natural factor of the environment, as is rain or snow. To survive and protect their assets they must become directly involved in fire management, including fuel reduction activities and support for their local fire service brigade. The land-use planning agencies have to pay highest attention to the “connectivity of land and disturbance” and the inter- and intra connections of all fire related factors.

Another aspect of mismanagement of land and forests is the closure of, or failure to maintain, access tracks that give vital access for fire-fighters, enabling them to attack fires before they become too large. A fundamental tenet of fire control is to detect it quickly, get to it quickly and knock it down while it is still small.

It may not be possible to prevent wildfires completely, but wildfire resilience can be improved through good forest management and landscape planning. This should focus on reducing the likelihood of wildfires occurring, reducing the severity of damage and impacts on people and the environment if they do occur, and assisting with fire suppression activities.

2. THE WAY AHEAD

Fire intensity is directly related to the amount of available fuel. The only realistic way to avoid large, high intensity vegetation fires is to keep (vegetation) fuel levels down to low levels. Low fuel levels mean mild fire intensity, easy controllability and minimal damage.

Beyond mechanical tools and grazing for reduce broad-scale fuels, prescribed burning under mild weather conditions is a realistic solution. Of course, active management of fuels by fuel reduction burning is not something that can be embarked upon overnight. It requires careful research into fire behaviour in a variety of fuel and vegetation types, and the sad fact is that this research has not been carried out in a systematic way in most European States. Landscape Planning in return, is often neglecting fire management in their overall land use plan. A positive example is a small program that has been carried on by the Forestry Commission of the UK. Some of the results could be put into practice now but much more research needs to be done to encompass the range of forest and fuel types across Europe.

Prescribed burning, in this context, is the planned use of low intensity fire, under mild weather conditions, to reduce fuel loads over broad areas of vegetated land. So that when fires do occur, they are of lower intensity and are much easier, and very much cheaper and safer, to control. This requires active management of (vegetation) fuels on a broad scale, but it will not happen unless there is a dramatic change in land management policies by managing administrations. A certain minimum amount of prescribed burning is necessary to achieve a high level of protection. This idea of a threshold level of burning is missed by most people who are inexperienced about fire, and is the flaw in the argument that prescribed burning is OK so long as it is restricted to small areas around settlements.

On the one hand we have people with experience in fire management and firefighting and people who have been directly affected by the fires. This sector is making very clear demands for greatly increased prescribed burning programs to prevent disaster fires happening again. On the other hand we have a raft of academics and green activists giving their take on the issue. Their position is confusing, in that they say they support “targeted” or “strategic” prescribed burning, but oppose broad-scale fuel reduction. In general, they oppose effective prescribed burning programs. In addition, a third element (of the general public) does purely rely on fire suppression by the state fire services.

A key issue, however, is the extent of fuel reduction burning. If “targeted” means small buffer areas around settled areas then this is futile. Buffer burns like that will not stop large wildfires, as they will simply throw spot fires over the buffer zone. Worse still, this approach means abandoning the main land and forest area to the devastating impact of large intense wildfires.

The idea that large wildfires are an inevitable consequence of global warming is illogical. The fact is that if a proper system of fire management is instituted, involving efficient detection, good access, fuel reduction and an effective fire fighting force, the computer-generated predictions of future climate will add a new challenge, but will not make intense wildfires inevitable.

The tools for better land-use planning should support the adoption of a Good Practice approach to vegetation fire management in Europe.

What is a Good Practice Vegetation Fire Management System? It is a package of policies and activities that:

- Delivers community protection from destructive vegetation fires.
- Minimizes undesirable impacts on the environment and needless costs to the Government and the community.
- Maximizes firefighter safety
- Is based on credible science.
- Has widespread political, community and media support.

3. TRAINING STANDARD IN WILDFIRE RISK PLANNING FOR FIRE AND LAND PLANNERS

Competency standards are often used as the fundamental part of a competency based training system. Competency standards are a description of the performance required in a work situation, with the knowledge needed to support that activity, in a context or range of situations.

In the European Qualifications Framework context competency standards can be used to define learning outcomes and to capture experience. This means that competency standards can be used to support work based training and qualifications at a particular level of activity.

The emphasis on the outcomes of learning, the end result, is a big change from the traditional approach to training that emphasized inputs, for example the number of training hours. Competency standards are normally written as general statements sufficient to describe the activity. The detail is in other documents, training manuals, assessment guidance and other reference material.

The main benefits of competency standards are to:

- support a better match between the needs of the labour market and education and training provision
- facilitate the validation of practical experience and informal learning as well as formal training
- help the transparency of qualifications across different countries training systems

Before starting to elaborate this training standard, some experts - participants of some of the workshops carried out during the project - were consulted in order to have a state-of-the-art of competencies, studies, degrees or other university studies that integrates wildfire risk planning:

- [National Park Service – US Department of the Interior](#) → US National Park Service has been developing a plan for the training and development of his employees. The *Management & Aviation Career* includes a set of detailed competencies for *Prevention Specialists*, *Fire Managers* and *Fire and Fuels Specialist* positions. Knowledge, Skills and Abilities required in these competencies have been a reference for developing the training standard in wildfire risk planning, although it is much more specific and less ambitious.
- [Master of Landscape Architecture](#) (Polytechnic University of Catalonia, Spain) → Postgraduate Course *Green Urban: Urban Green with Natural Spaces* (30h). The analysis and the evaluation of natural perturbations (focused on wildfires) through different lectures: cultural, visual, environmental, etc. In this case, postgraduate students develop a ‘real’ project based on the need to protect urban spaces and forests from wildfires propagation, providing also safety zones for firefighters work. Catalan Fire Service cooperates with this Course.

- [Master en Incendios Forestales](#) (University of Lleida, University of Leon and University of Córdoba, Spain). The subject *Landscape Management and Defense against Wildfires* has a completed academic curriculum for Master's students related to define and quantify preventive actions face to wildfires.

Training Standard Test

This experienced-based training standard in wildfire risk planning for land and fire planners was tested during two pilot sites, in UK (Northumberland, 8th April 2015) and Spain (Santa Coloma de Farners, 6th May 2015). Participants of these pilot sites were asked to answer a survey (Annex I), before receiving the *Methodology for incorporating large fire risk into landscape management decision making* (Task 3.2, FIREfficient Project). The aim of this survey was to determine the professional profile for this training standard, to evaluate general and specific knowledge of this training standard, and to review the previous necessary skills to obtain this training standard.

Only participants of the UK Pilot Site were asked to answer the same questions after receiving the training in order to test the methodology and the learning. Results are discussed below.

3.1. About this training standard

3.1.1. General Idea

Traditional vegetation fire management, i.e. fire suppression strategies have not delivered the intended result. Fires across Europe are getting more in numbers and frequency as well as in intensity and related damage levels Table 1.

TABLE 1. NUMBER OF FIRES AND BURNT AREA IN FIVE SOUTHERN MEMBER STATES IN THE LAST 33 YEARS
(JOINT RESEARCH CENTER, 2012)

<i>Number of fires</i>	PORTUGAL	SPAIN	FRANCE	ITALY	GREECE ^(*)	TOTAL
2012	21 176	15 902	4 105	8 252	1 559	50 994
% of total in 2012	42%	31%	8%	16%	3%	100%
Average 1980-1989	7 381	9 515	4 910	11 575	1 264	34 645
Average 1990-1999	22 250	18 152	5 538	11 164	1 748	58 851
Average 2000-2009	24 949	18 337	4 406	7 259	1 695	56 645
Average 2010-2012	22 808	14 551	4 168	9 736	1 408	50 040
Average 1980-2012	18 613	15 263	4 880	9 736	1 554	50 046
TOTAL (1980-2012)	614 228	503 690	161 036	321 294	51 282	1 651 530
<i>Burnt areas (ha)</i>	PORTUGAL	SPAIN	FRANCE	ITALY	GREECE	TOTAL
2012	110 231	209 855	8 600	130 814	59 924	519 424
% of total in 2012	21%	40%	2%	25%	12%	100%
Average 1980-1989	73 484	244 788	39 157	147 150	52 417	556 995
Average 1990-1999	102 203	161 319	22 735	118 573	44 108	448 938
Average 2000-2009	150 101	125 239	22 342	83 878	49 238	430 798
Average 2010-2012	105 711	116 372	9 433	83 118	32 678	347 313
Average 1980-2012	108 334	171 593	26 383	113 496	47 141	466 947
TOTAL (1980-2012)	3 575 020	5 662 572	870 632	3 744 360	1 555 659	15 409 243

(*) Numbers of fires are incomplete since 2009

Therefore, fire resilience and mitigation to reduce the impact of unwanted fires need more consideration. This starts with the planning process in landscape and land-use planning. With the development of generic competency standards this project aims to support this development for more resilience based fire planning. Experience and competency levels have to be defined and described in the format of a standard.

Knowledge and experience in vegetation fire management is something that takes many years for people to attain. Fire behaviour is complex and the theory needs to be understood but also observed and tested in real burning and fire suppression situations to allow a person to learn and gain confidence. Transferring this experience to the planning level will be key for future fire management.

Adapt prevention structures to the *fire type* in each territory is based on identifying the *critical points* for every *fire type* and the existing opportunities in the landscape. The knowledge of fire patterns and historical fire data, complemented by the fire services experience, must be included in this training standard.

3.1.2. Scope

This standard sets out good practice for developing wildfire resilience into land management planning in three levels: regional planning, landscape planning and forest planning. This training standard aims to help reduce the likelihood and severity of wildfires in forests, woodlands and other land in Europe and promote appropriate fire mitigation regimes. It is primarily focused on the planning measures that can be used and only covers operational issues, such as fire suppression activities, where they benefit from some element of land management planning.

3.1.3. Target

The main professional profiles suitable to obtain this competency are: land use planners, fire planners, forest managers, emergency planners and urbanists. In addition, it is recommended to forest and woodland owners and managers, forestry practitioners, planning teams and all those involved in adaptive management to build resilient forests and landscape. Specially to foster the cooperation and the understanding among all the stakeholders.

As shown in Table 2, 83% of professionals attending the pilot sites had one or more professionals profiles required for acquiring this training standard, considering Forest managers, Emergency managers, Land planners, Fire managers, Forest owners and Degree/Master University Students (Other). The only professional profile not represented in this survey are urban planners. The 83% of surveyed had more than 5 years of experience, and they worked at three spatial scales: local (30%), regional (38%) and national (23%).

TABLE 2. RESULTS OF QUESTIONS 1, 2 AND 3 OF THE SURVEY (SEE ANNEX I)

Professional profile surveyed		Years of experience				
		< 5	6-19	20-29	>30	N/A
Forest manager	14	7,14%	64,29%	28,57%	-	
Emergency manager	3	-	33,33%	33,33%	33,33%	
Land planner	9	-	55,56%	33,33%	11,11%	
Fire manager	9	-	33,33%	55,56%	-	11,11%
Research	3	33,33%	33,33%	33,33%	-	
Forest owner	3	-	66,67%	33,33%	-	
Other	5	80,00%	20,00%	-	-	
TOTALS	46	13,04%	47,83%	32,61%	4,35%	2,17%

On the one hand, and as it could be expected, 100% of Spanish surveyed considered that wildfires are the most frequent disturbance in their territory, 63% of which think that wildfire risk is more relevant than risk caused by other disturbances in their territory (Figure 1).

On the other hand, 53% UK surveyed professionals considered that wildfires are the most frequent disturbance in their territory – most are moorland specified one of them -. Coherently, 65% perceive that wildfire risk is not more relevant than risk caused by other disturbances in their territory. In contrast, 35% of surveyed in UK consider that in their territory wildfire risk is more important than risk caused by other disturbances.

Therefore, in both countries, wildfires are a frequent disturbance that can endanger people and natural resources.

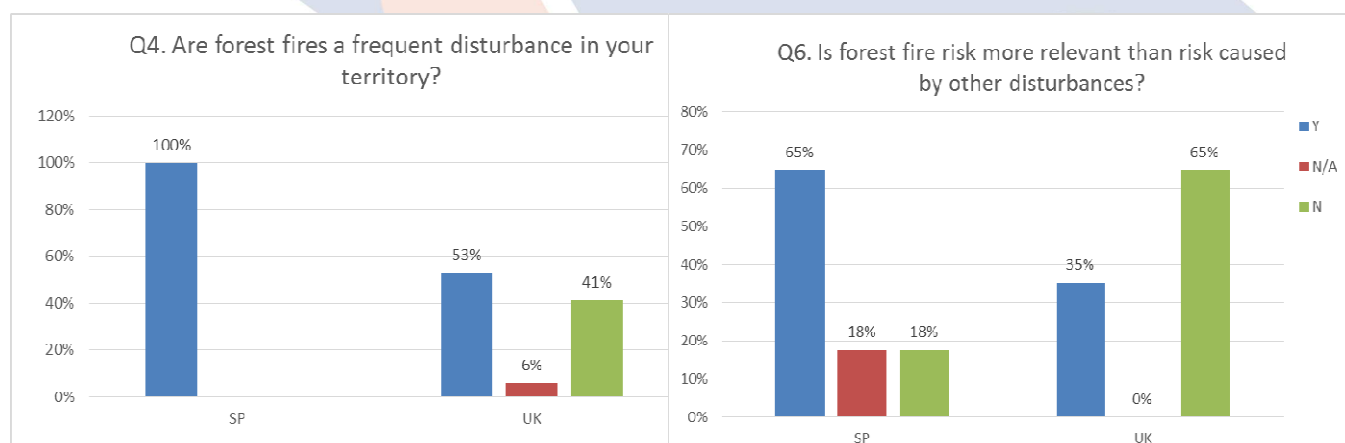


FIGURE 1. RESULTS OF QUESTIONS 4 AND 6 (ANNEX I)

3.1.4. Specific training standard

It may not be possible to prevent wildfires completely, but wildfire resilience can be improved through good forest management planning. The acquisition of this training standard will allow professionals to

identify opportunities in the landscape in order to reduce wildfire propagation and support extinguishing actions (reducing fire intensity).

Concretely, professionals with this training standard will be able to decide the best place to create preventive infrastructures for mitigating wildfires depending on the expected fire behaviour. Professionals will be able to design these preventive infrastructures detailing some specifications as size, shape, secure accesses and/or vegetation distribution inside and surrounding the infrastructure to improve landscape resilience, after acquiring this competency.

Beyond planning and designing infrastructures, land and fire planners must be able to involve local community looking for economic benefits from creating these prevention infrastructures (economic benefits).

3.2. Acquisition and maintenance of this training standard

3.2.1. Previous skills required

As described below, in 3.2.2. *Training Standard Achievement*, one of the most important steps to acquire this competency is to be capable to determine the *fire types* a the territory. Previous skills required for the process of acquisition of this training standard are:

- **Local and regional Meteorology and its interaction with the territory**

The role of climate for the increase of adverse weather episodes (drought and high temperatures) is relevant for the development of large wildfires episodes. Understanding the interactions between meteorology and territory allow the landscape managers to understand the fire interactions at the local level. As an example, the same synoptic situation might does not mean the same (in terms of weather conditions) in two different points in the same country.

A part from that, it is essential a very well knowledge of wind interactions to enforce the ability to predict the fire behaviour in a local level in the way to a better understanding of fire patterns and also to prevent accidents.

- **Ability to read cartographic maps, focusing in ravine bottoms, crests and mountain pass**

The ability to read and understand cartography is essential for anybody who needs to identify the Strategic Management Points (defined in 3.3.1.). Is essential for this to learn the differences among, ravines, steep slopes, crests, etc. As shown in Report *Methodology for incorporating large fires risk into landscape management decision making* (Task 3.2, FIREfficient Project), this changing orography does not mean the same in terms of the evolution of fire behaviour. Therefore, it is essential to know these points as a tool for the landscape managers, to change the fire behaviour from high to lower intensity, from high to low severity.

These changes in orography are in the same way, the best places to create the opportunities for the fire services through the Strategic Management Points.

Related to these previous skills required, and according to Figure 2, the majority of surveyed participants met the requirements, probably because of be their professional profile, their long professional experience and/or their level of education (university studies):

- Describe three weather conditions that favour wildfire risk. The most answered conditions are dry days, high temperatures (Question 16)
- Draw three ridges and two ravines on a map (Question 17)
- Note some recent wildfire in their territory (Question 18)

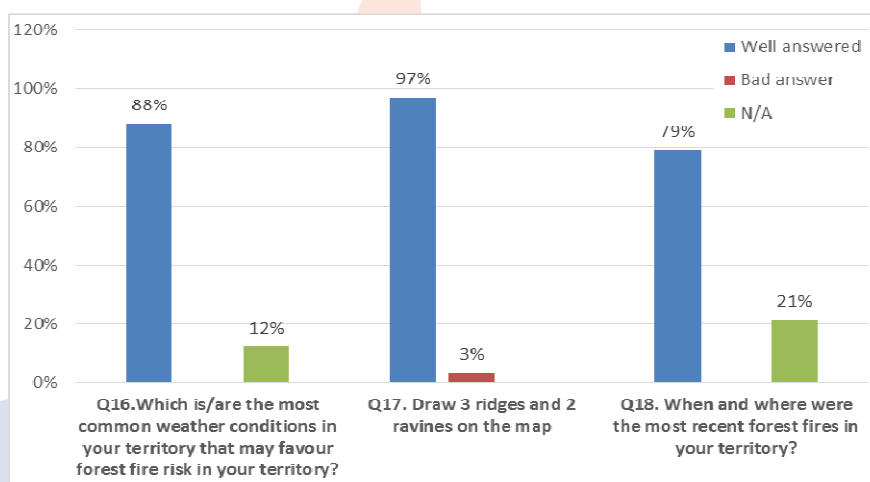


FIGURE 2. RESULTS OF QUESTIONS 16, 17 AND 18 (ANNEX I)

• Development of management plans

Building wildfire resilience can be considered under each of the seven stages of the forest management planning process: **Scoping, Survey, Analysis, Synthesis, Implementation, Monitoring and Review** (UK Forestry Commission, 2014). Knowing the basis of management plans is a requires skill for this competency.

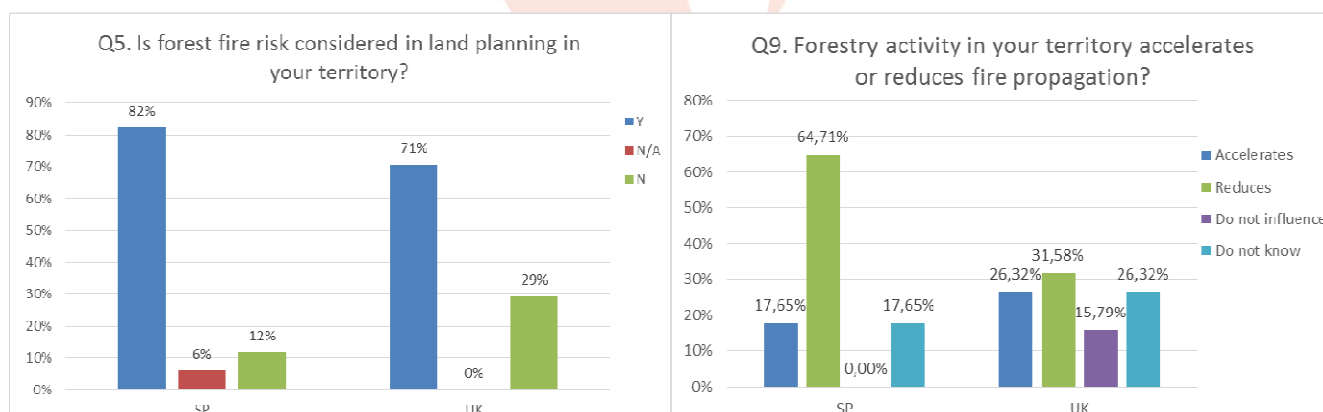


FIGURE 3. RESULTS OF QUESTIONS 5 AND 9 (ANNEX 1)

3.2.2. Training standard achievement

In order to acquire this competency, previous skills defined above must be proved. Then, as demonstrated during the two pilot sites, students must attend a complete training to understand concepts and methodologies used to integrate wildfires risk into landscape, or prove previous competencies acquired for this purpose. In order to mitigate specific lacks of knowledge of students attending to this training, some specific actions must be taken to achieve this competency:

- **Lack of experience with real fire** (wildfires or prescribed burning) → A field visit will be mandatory to understand wildfire dynamics, fire effects on vegetation and effects of fire behaviour on the landscape. And, if possible, students will have to attend to a/some prescribed burning/s to understand fire behaviour.
- **Lack of knowledge on planning tools** → Maps will be constantly used during the training, and cartographic analysis will be constantly carried out to ensure students understand and apply planning concepts.

It is recommended to use a 'real scenario' during the training on which students must apply the theoretical concepts. This 'real scenario' must be visited on the field after theoretical sessions to check the planned results obtained.

At the end of the training, students must demonstrate the acquired knowledge on an exam, and the capability to be able to integrate wildfire risk into the landscape through exercises.

3.2.3. Training standard maintenance

Once students have obtained the competency, they must continue integrating the methodology in forest management and contingency plans for those areas with high risk of wildfires in their territories. It is also recommended to assist to situation with real fire (prescribed fire), and to be abreast of news related to wildfires in their areas. It is also required to be continuously in communication with wildfire collaborative networks in the territory (as Wildfire Groups, or Gavarres Group in Girona).

3.3. Training standard knowledge

Knowledge required for acquiring this training standard is based on experienced-methodology developed and tested during last decades by some European Fire Services that can be exported to other areas as forest management, land planning or urbanism planning. This part of the document has been elaborated parallel to the *Deliverable 3.2 Methodology for incorporating large fires risk into landscape management decision making* in order to define the needs of this competency (Figure 4).

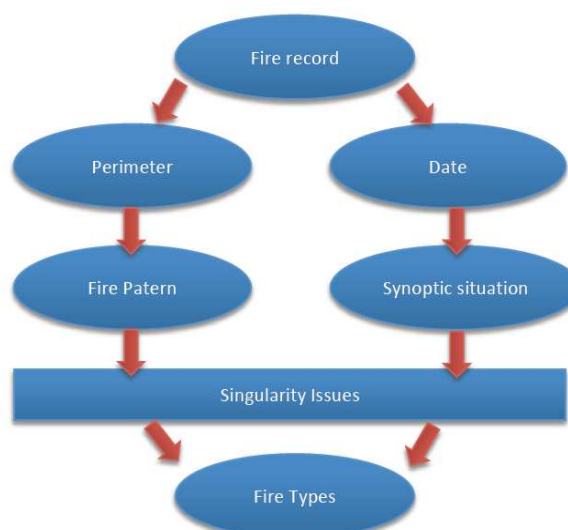


FIGURE 4. CHARACTERIZATION PROCESS OF HISTORICAL WILDFIRES (PIQUÉ, ET AL., 2011)

3.3.1. General knowledge

- **Basic concepts of fire behaviour.** Fire behaviour can be described as the reaction of a fire to the influence of fuel, topography and weather conditions (fire triangle). Understanding and being capable to detect when this fire behaviour will change during a wildfire is crucial to obtain this competency.

More specifications related to fire behaviour must be clarified and previewed for designing Strategic Management Points: spot fires, rate of speed of the front of fire and intensity of fire (detailed below).

- **Spread patterns.** The concept of *spread patterns* refers to the key element to outline the way in which the fire spreads over the terrain. Depending on the *spread pattern*, three main types of fire can be distinguished: topographic, wind-driven and plume fires.

The 75% of surveyed participants of the two pilot sites had some difficulties to answer the questions related to *spread patterns* (questions 20, 22 and 25), before the training described in *Methodology for incorporating large fires risk into landscape management decision making* (Task 3.2, FIREfficient Project). Questions 20 and 22, focused on Wind-driven Fires, were correctly answered by the 32% and the 19% of participants respectively, while they were answered wrong or not answered by the 68% and the 81% respectively.

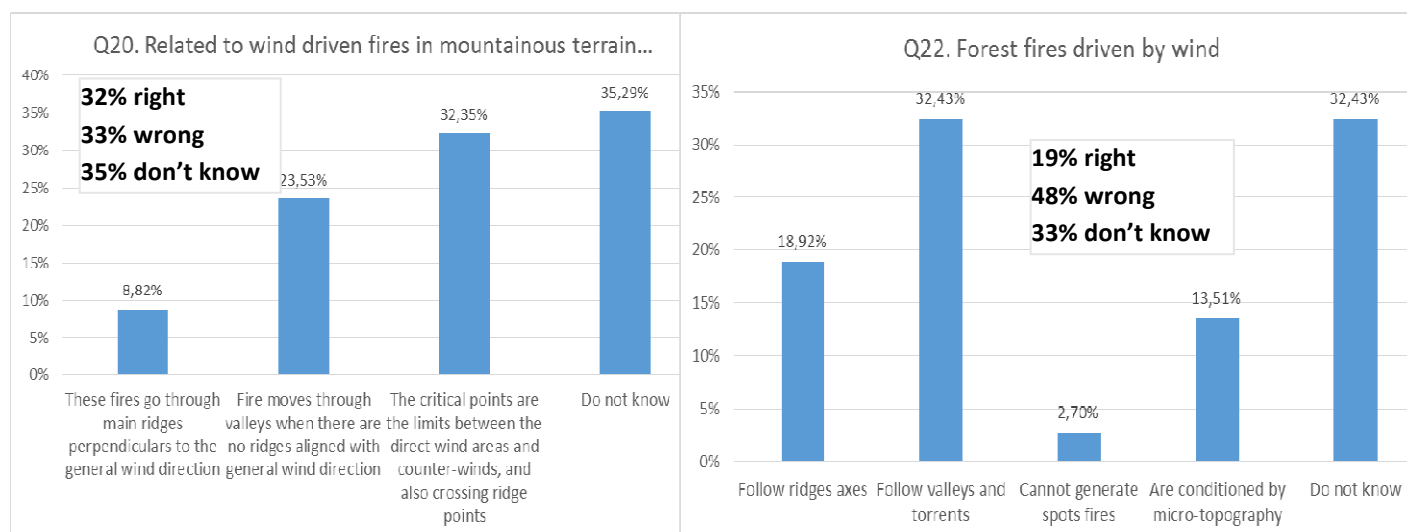


FIGURE 5. RESULTS OF QUESTIONS 20 AND 22 (ANNEX 1)

Most of UK participants (71%) did not know if *spread patterns* could be applied to their territory, while 65% of Spain participants considered that they could be applied (Figure 6). One of the reasons of this considerable difference could be that wildfires in Spain are the main natural disturbance (Figure 6), and Spanish land and fire planners are familiarised with this concept, or at least, they know that this patterns classification is used in the territory.

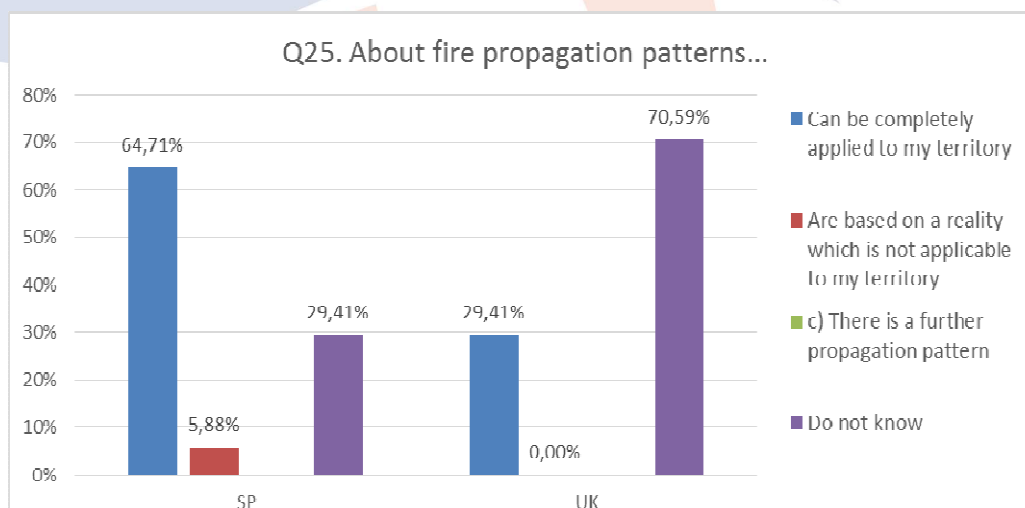


FIGURE 6. RESULTS OF QUESTION 25 (ANNEX 1)

In general, *spread patterns* concept is new for the majority of the professional profiles surveyed in the two countries. This concept must be perfectly understood for obtain this training standard.

- **Critical points.** After determining *spread patterns* for a territory, *critical points* must also be defined. It is necessary to understand *critical points* concept being the first step for identify strategic management points.

Questions 19 and 21 of the survey were intended to get an approach of knowledge of *critical points*. For question 19, 40% of professionals surveyed answered correctly, 53% answered wrong and 7% did not know what to answer (Figure 7). Question 21, focused on a more detailed understanding of the concept, was well answered by the 53% of surveyed, while 26% answered wrong and 23% did not answer (Figure 8).

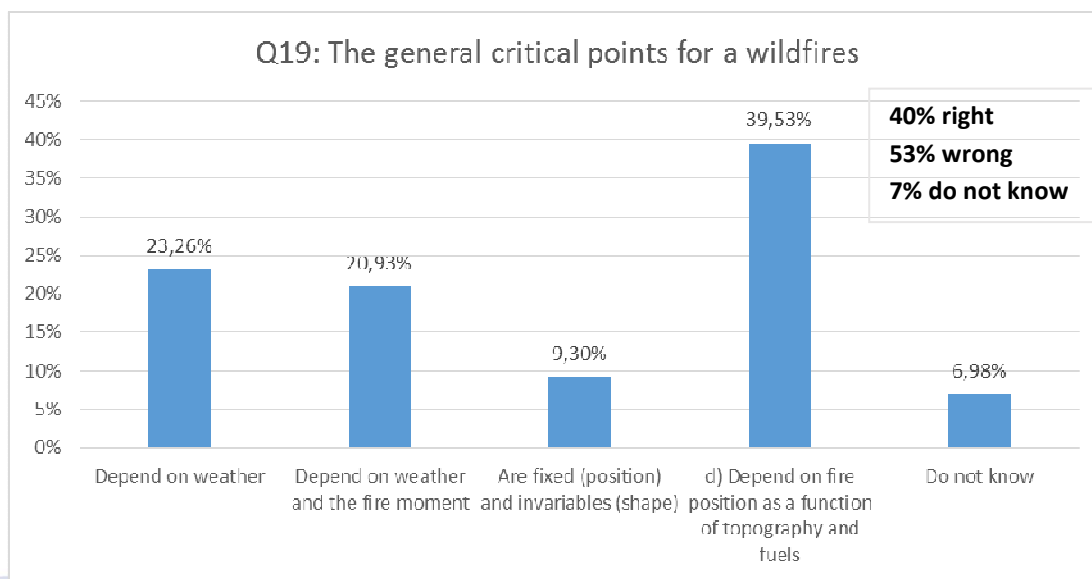


FIGURE 7. RESULTS OF QUESTION 19 (ANNEX 1)

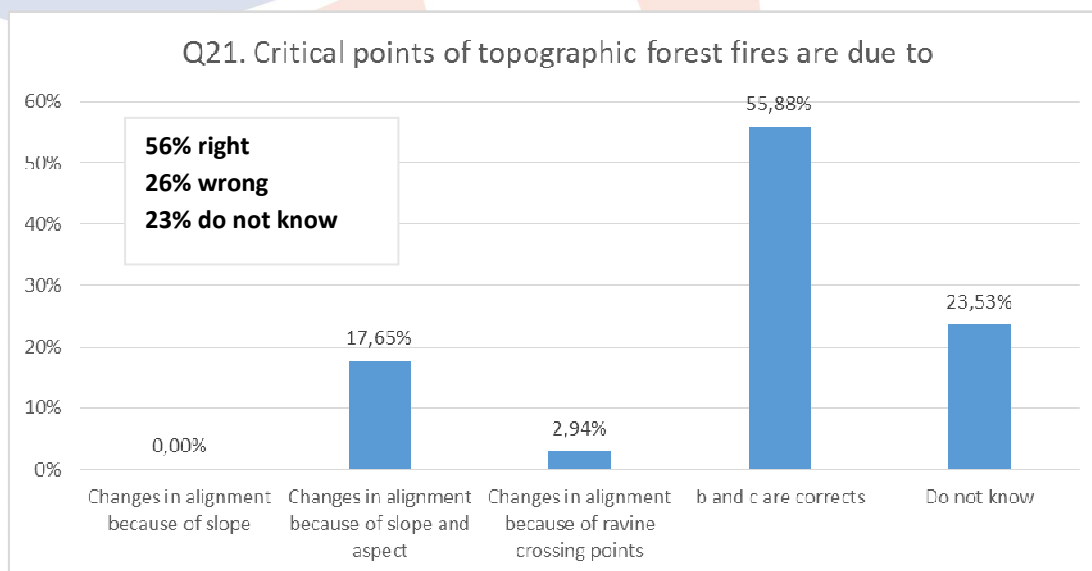


FIGURE 8. RESULTS OF QUESTION 21 (ANNEX 1)

We can say, then, that *critical points* are not a strange concept for some of professionals asked (50% in average), but in any case, this concept must be well understood in this competency.

- **Fire types.** When analysing historical fires, it becomes obvious that under the same topography and weather (synoptic situation) conditions, fire spreads following similar spread schemes. The *Fire types* are based on *spread patterns* mentioned before and derived from the analysis of specific meteorological and topographical local aspects.
- **Strategic Management Points (SMP) concept and objectives.** These areas identified as potential opportunities, adapted to the requirements of the suppression service, reduce fire behaviour – during a wildfire - . The main objectives attended of these Strategic Management Points are:
 - a) **Reduce Fire Speed of propagation**, which is the rate of advance of a wildfire (km/h or miles/h)
Which is the expected rate of spread of a potential wildfire in this territory?
 - b) **Reduce distance of spot fires.** Spot fires are fire outside the main fire perimeter caused by sparks and embers transported by the wind or convection column.
Have the wildfire the capability to generate spot fires? Which will be the maximal distance of spot fires during a wildfire?
 - c) **Reduce fire intensity and its behaviour.** When talking about wildfires, ‘intensity’ can be translated in terms of flame length. Intensity will be closely related to forest structure and fuel availability.
 - d) **Build anchorage zones.** An anchorage area is any kind of point with no fuel where that fire service needs to starts extinguishing manoeuvres.
 - e) **Build Safe Zones.** A safe zone is an identified area of safety where people will find refuge. This is one of the five basic concepts of the LACES protocol needed to ensure safety in Wildfires Suppression Practices. Strategic Management Points must be safety zones for staff of extinguishing services.

When asking to participants about applicability of SMP (Strategic Management Points) methodology in their territory, more than 50% did not answer in both countries, probably reading this concept for their first time. However, in Spain, 47% considered that this methodology could be applied to the territory, while in UK 17% of participants had the same perception. After the training, perception of UK participants had completely changed, increasing to 75% of professionals believing that SMP methodology could be applied (Figure 9).

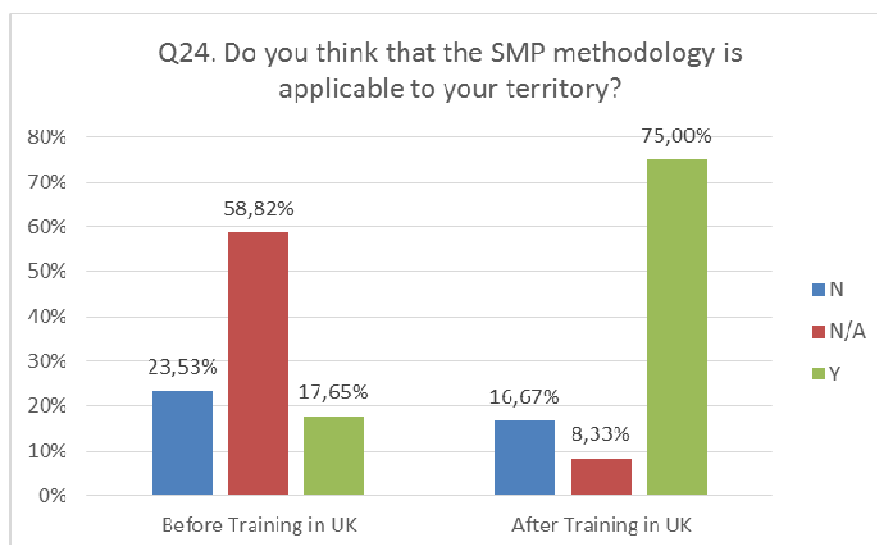


FIGURE 9. RESULTS OF QUESTION 24 (ANNEX 1)

- **Fire ecology. The role of fire in forest ecosystems.** Roles of fire on ecosystems are **(a) renovation**, related to severe fires that burn all vegetation in an area implying the substitution of individuals by new ones. And **(b) maintenance**, related to low or medium severity fires, affecting partial or completely herbaceous and shrub vegetation, but affecting partially trees.

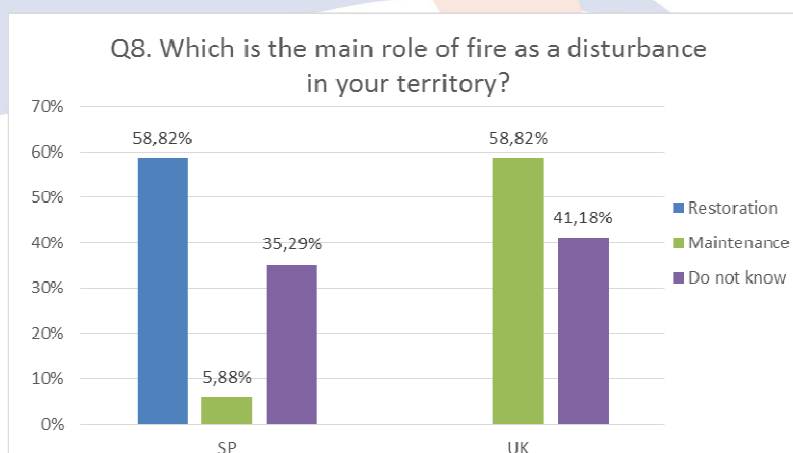


FIGURE 10. RESULTS OF QUESTION 8 (ANNEX 1)

3.3.2. Specific knowledge

- **Historical fires data of the local area**

As shown in Figure 2, 70% of surveyed could answer. 'When and where were the most wildfires in your territory?' which means the local people has realized of this value, and its relevant information to understand (and may to predict) the future fires. The knowledge of past and recent fires is the keyword to set the data about the different types of fire propagation that can occur in a particular orography.

In a particular territory, the same weather situation, over the same orography, results in the same fire propagation pattern, which means similar fire behaviours and movements that seen in a past fire. This is the essential key, jointly with the weather information and also the understanding of cartography to begin the understanding of *fire types* concept.

- **Identify most relevant propagation patterns in the local area**

The identification (and the summarization) from different fire behaviours, fire movements, etc. to a fire pattern allow the land managers to compile methodologies for the SMP identification for each *fire type*.

- **Strategic Management Points design**

Strategic Management Points must be defined to protect population and environment through fire hazard reduction.

- a) **Situation and type of SMPs.** Once *spread patterns* and *fire types* have been defined for a territory, then, it is possible to determine the best situation for SMPs. Each *spread pattern* and *fire type* have some SMPs associated, but they must be adapted in each territory. Understanding and recognising all specific needs for integrating wildfire risk into a territory is one of the keys of this competency.
- b) **Prevention infrastructures typology** depending on fire behaviour expected.
 - **Secure zone** (described above)
 - **Water supplier:** Is a facility that provides water for the fire services in isolated places with a pre-known time.
 - **Low-fuel-load strip:** Is an area where fuel treatments have been doing with the aim to reduce the fire propagation level.
 - **Anchor point** (described before)
- c) **Distribution and structure of vegetation inside and surround prevention infrastructure**
Final density and distribution of vegetation inside and surround the preventive infrastructure must be defined. As described in *Large forest fire risk assessment and fuel management: operational tools and integrated approach* (Task 2.1, FIREfficient project), a set of Fuel Management Tools for Fire Hazard Reduction can be applied to broke fuel continuity and reduce fuel loading.

Figure 11 shows the most used preventive treatments in each country. According to the answers, in Spain, mechanical treatments are much more used (63%) than grazing (5%) or prescribed burning (5%). In the UK, mechanical treatments and grazing to prevent forest fires are used to the same extent, and prescribed burning is the most used treatments for this purpose.

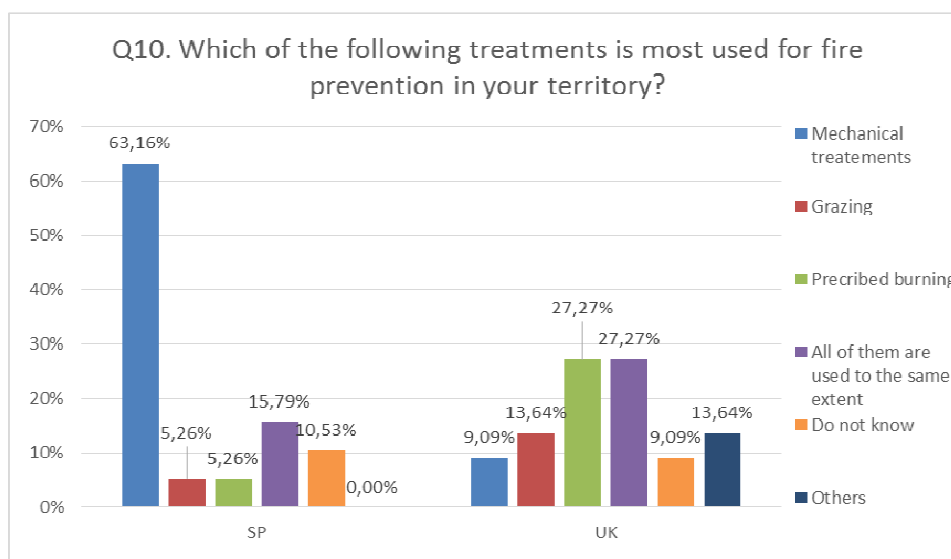


FIGURE 11. RESULTS OF QUESTION 10 (ANNEX 1)

- **Validation of Strategic Management Point and Infrastructures**

- a) **Simulators for validation**

As exposed in the Report *Large forest fire risk assessment and fuel management: operational tools and integrated approach* (Task 2.1, FIREfficient project), some Empirical Models can simulate *the spread of wildfires across landscape in real time, or ideally faster than real-time, in order [...], and to help manage landscape for fire risk.*

These simulators can be used, for example, to validate the preventive infrastructures designed previously, and to test the resilience of our landscape. During the training in the Spanish pilot site, Wildfire Analyst™ was used to validate the *fire type* determined and the *planned infrastructures*. Results of this validation were verified on a field visit. Also, colleagues from Mourne Mountains (North Ireland) explained us, during the Pilot Site in UK, the use of these empirical models to ascertain fire behaviour over the Eastern Mournes under two different weather patterns (*The Eastern Mournes Wildfire Report, 2012, Annex in Methodology for incorporating large fire risk into landscape management decision making, Task 3.2 FIREfficient Project*).

- b) **Field validation**

As it has been said during the development of this document, it is necessary to validate Strategic Management Points on the field. Situation and vegetation structure of SMP must be analysed *in situ* to verify that propagation rate speed of fire would decrease in this areas and fire would change its behaviour.

- **Collaborative Network**

The Eastern Mournes Wildfires Report *recognised the importance of establishing a collaborative problem solving approach between land managers, the fire service, relevant agencies and other*

stakeholders [...]. During the pilot site in Spain, we could met a collaborative network in Girona (Gavarres Consortium), through which 80% of designed preventive infrastructures have been executed. Unfortunately, this success experience in Girona is not the tendency in Spain, 47% of surveyed participants answering 'No' to the question 'Is there a collaborative network between land managers and local actor?' and 18% not answering. On the other hand, 76% of UK participants answered 'Yes' to that question and specified as an example 'Wildfire Groups'.

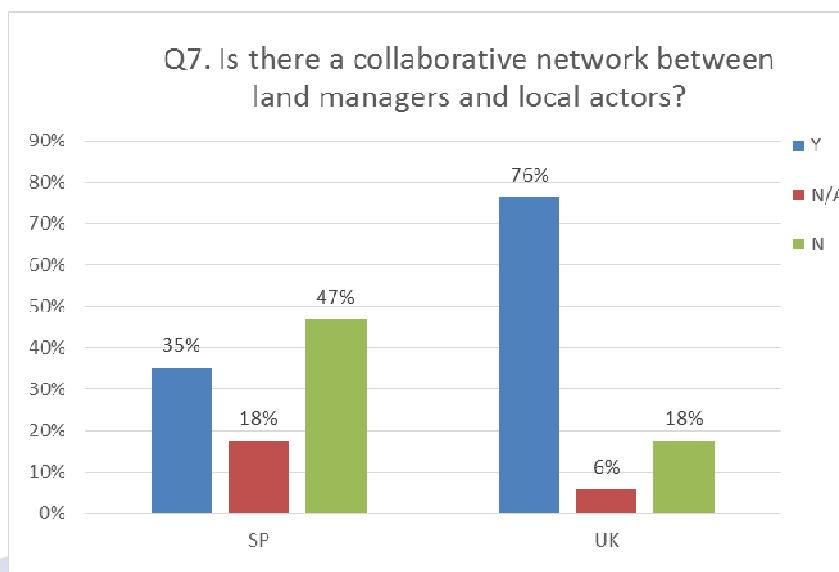


FIGURE 12. RESULTS OF QUESTION 7 (ANNEX I)

3.4. Evaluated skills

3.4.1. What must be known and understood? (Knowledge)

- Knowledge and understanding of fire behaviour, fire weather and fire danger
 - Weather conditions, topography and fuel
 - Changes on fire behaviour propagation. Campbell Prediction System
 - Wildfires Generation concept
- Knowledge and understanding of characteristically *spread patterns*
 - Topographical, Wind-driven and Plume
- Knowledge of Strategic Management Points concept and objectives
- Knowledge of all tools available in the territory to reduce fuel load
- Knowledge of the methods and techniques of prescribed fire and fuels management
- Expert knowledge of the ecological response to the presence or absence of fire
- Knowledge of fire effects as it relates to fuel manipulation and prescribed fire
- Expert knowledge of environmental laws, regulations, and policies
- Knowledge of empirical models to simulate spread of wildfires across landscape, including Geographic Information Systems

3.4.2. What must be able to do? (Skills and abilities)

- Ability to implement mitigation measures to reduce risks identified in an approved fire prevention plan
- Apply the methodology to define and implement Strategic Management Points:
 - Ability to conduct an analysis of historical fire records and determine specific areas where mitigation measures can be developed and implemented
 - Compile historical information of: wildfires, weather conditions and landscape management
 - Define *Spread patterns* in the territory
 - Define *Critical points* in the territory
 - Define Strategic Management Points
 - Determine vegetation treatments inside and surround the strategic management points
 - Validate pre-suppression infrastructures defined in the territory
- Ability to cooperate with local wildfire networks
- Knowledge and ability to participate in the interdisciplinary planning process
- Ability to develop and implement forest management and contingency plans
- Ability to develop mitigation measures designed to reduce hazards and risks
- Ability to monitor and evaluate Fire Hazard Reduction programs and determine their effectiveness in meeting management goals and objectives.

4. SUMMARY TABLE

1. About this training standard	
a) General Idea	Capacity for integrating wildfire risk into landscape planning, considering the fire types.
b) Scope	All landscapes susceptible of being protect from wildfires currently or in the future in all EU territory.
c) Target	Forest managers, emergency managers, land planners, urban planners, fire managers, forest owners.
d) Specific training standards	<ul style="list-style-type: none"> - Be able to identify opportunities in the landscape in order to reduce wildfire propagation and support extinguishing actions (reducing fire intensity) - Be able to involve local community through getting benefits from creating prevention infrastructures (economic benefits)
2. Acquisition and maintenance	
a) Previous training standards required	<ul style="list-style-type: none"> - Ability to understand local meteorology and its interaction with the territory - Ability to read cartographic maps, focusing in ravine bottoms, crests and mountain pass - Develop of forest management plans
b) Training standards achievement	<ul style="list-style-type: none"> - Attend to a training or demonstrate previous competencies acquired - Train specific lacks on knowledge due to specific professional profiles - Demonstrate the acquired knowledge on an exam, and the capability to be able to integrate wildfire risk into the landscape through exercises
c) Training standards maintenance	<ul style="list-style-type: none"> - Integrate the methodology in forest management and contengy plans

	<ul style="list-style-type: none"> - Assist to situation with real fire (prescribed fire) - Abreast of news related to wildfires in a concrete territory - Participate in a local collaborative wildfire network
3. Training standard knowledge	
a) General knowledge	<ul style="list-style-type: none"> - Review Previous Skills Required - Understand Spread Patterns concept - Understand Fire types concept - Understand Management Strategic Points concept and objectives - Understand basic concepts of Fire behaviour: spots, speed of propagation and intensity - Forest structure / Vertical and horizontal continuity - Knowledge on local Fire ecology species and role of fire in the ecosystem - Knowledge of effects of different fire intensities on vegetation
b) Specific knowledge	<ul style="list-style-type: none"> - Compilation of historical fires data of the local area - Identify most relevant propagation patterns in the local area - Knowledge on fire behaviour: low, medium and high intensity - Define situation of Strategic Management Points in a territory - Define prevention structures typology and size depending on fire behaviour expected: secure zone, deceleration area, water supplier point, low-fuel-load strip and anchor points - Be able to identify and ensure secure access to prevention infrastructures - Be able to modify fuel (vegetation) in order to improve landscape resilience

	<ul style="list-style-type: none"> - Validate Strategic Management Point with simulations and on the field - Maintain a fluid communication with extinguishing fire services and capitalize their experience
4. Evaluated skills	
a) What must be known and understood?	<ul style="list-style-type: none"> - Knowledge and understanding of fire behaviour, fire weather and fire danger - Knowledge and understanding of characteristically spread patterns - Knowledge of Strategic Management Points concept and objectives - Knowledge of all tools available in the territory to reduce fuel load - Knowledge of the methods and techniques of prescribed fire and fuels management - Expert knowledge of the ecological response to the presence or absence of fire - Knowledge of fire effects as it relates to fuel manipulation and prescribed fire - Expert knowledge of environmental laws, regulations, and policies - Knowledge of empirical models to simulate spread of wildfires across landscape, including Geographic Information Systems
b) What must be able to do?	<ul style="list-style-type: none"> - Ability to implement mitigation measures to reduce risks identified in an approved fire prevention plan - Apply the methodology to define and implement Strategic Management Points: <ul style="list-style-type: none"> - Ability to conduct an analysis of historical fire records and determine specific areas where mitigation measures can be developed and implemented - Compile historical information of: wildfires, weather conditions and landscape management - Define <i>Spread patterns</i> in the territory - Define <i>Critical points</i> in the territory

	<ul style="list-style-type: none"> - Define Strategic Management Points - Determine vegetation treatments inside and surround the strategic management points - Validate pre-suppression infrastructures defined in the territory - Ability to cooperate with local wildfire networks - Knowledge and ability to participate in the interdisciplinary planning process - Ability to develop and implement forest management and contingency plans - Ability to develop mitigation measures designed to reduce hazards and risks - Ability to monitor and evaluate Fire Hazard Reduction programs and determine their effectiveness in meeting management goals and objectives.
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ANNEX I – Survey Pilot Sites

Survey Objectives

Results of this survey will be analysed with the main objective of define and write training standards for fire and land planners. This survey is c **Survey Objectives**

Results of this survey will be analysed with the main objective of define and write training standards for fire and land planners. This survey is completely anonymous and will be filled by participants in three different pilot sites: Spain, UK and Germany.

Survey Questions

1. What is your professional profile?

Forest manager		Fire manager	
Emergency manager		Research	
Land planner		Politics	
Urban planner		Forest owner	

2. How many years of professional experience do you have in this sector? _____ years

3. What is the spatial scale of your work?

Local		Regional		National	
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4. Are forest fires a frequent disturbance in your territory? YES / NO

5. Is forest fire risk considered in land planning in your territory? YES / NO

6. If yes, is forest fire risk more relevant than risk caused by other disturbances (floods, wind, etc.)? YES / NO

7. Do you think that there is fluid communication (collaborative network) between land managers of your territory and local actors? YES / NO

If yes, write the name(s) of this / these collaborative network(s):

-
-
-
-

8. What is the main role of fire as a disturbance in your territory?

- a) Renovation
- b) Maintenance
- c) Do not know

9. Forestry activity in your territory:

- a) Accelerates fire propagation
- b) Reduces fire propagation
- c) Does not influence fire propagation
- d) Do not know

10. Which of the following treatments is most used for fire prevention in your territory?

- a) Mechanical treatments (chainsaw, etc.)
- b) Grazing
- c) Prescribed burning
- d) All of them are used to the same extent
- e) Do not know

11. Which fire generation describes best the most extreme fire behaviour in your territory during past 5 to 10 years?

- a) First generation
- b) Second generation
- c) Third generation
- d) Fourth generation
- e) Do not know

12. Which fire generation describes best a “current” fire season in your territory?

- a) First generation
- b) Second generation
- c) Third generation
- d) Fourth generation
- e) Do not know

13. Preventative fires measures that are undertaken in my territory, considering fire generations (fire behaviour) ...

- a) are completely insufficient
- b) lose their function because of fire behaviour
- c) are more than sufficient
- d) are not necessary at the moment, considering our current fire behaviour
- e) Do not know

14. Socioeconomic factors that have caused changes to landscapes in the Mediterranean basin, and consequently fire behaviour, ...

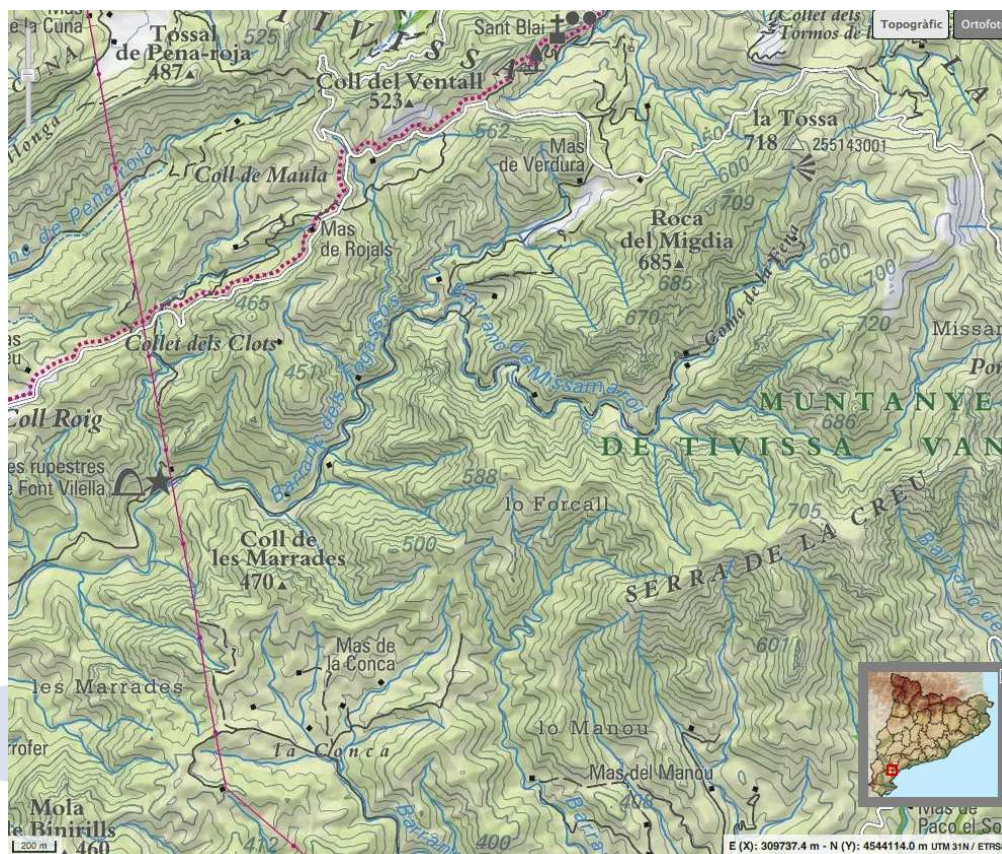
- a) are not absolutely applicable to my territory
- b) are completely applicable to my territory
- c) are partially applicable in my territory
- d) Do not know

15. Difficulties faced in the Mediterranean basin related with forest fires ...

- a) Cannot be transferred to my working area
- b) Can be transferred to my working area
- c) Will be a reality in the near future in my working area
- d) Do not know

16. Which is/are the most common weather conditions in your territory that may favour forest fire risk in your territory?

17. Draw 3 ridges and 2 ravines on the map:



Font: Institut Cartogràfic de Catalunya.

18. When and where were the most recent forest fires in your territory?

19. The general critical points for a wildfire:

- a) Depend on weather
- b) Depend on weather and the fire ignition
- c) Are fixed (position) and invariables (shape)
- d) Depend on fire position as a function of topography and fuels
- e) Do not know

20. Related to wind driven fires in mountainous terrain...

- a) These fires go through main ridges perpendicular to the general wind direction
- b) Fire moves through valleys when there are no ridges aligned with general wind direction
- c) The critical points are the limits between the direct wind areas and counter-winds, and also crossing ridge points
- d) Do not know

21. Critical points of topographic forest fires are due to:

- a) Changes in alignment because of slope
- b) Changes in alignment because of slope and aspect
- c) Changes in alignment because of ravine crossing points
- d) b and c are correct
- e) Do not know

22. Forest fires driven by wind

- a) Follow ridge axes
- b) Follow valleys and torrents
- c) Cannot generate spot fires
- d) Are conditioned by micro-topography
- e) Do not know

**23. Which of these measures (prevention and extinction) are being carried out in your territory?
Write 0 (not applied) or 5 (applied)**

- a) Facilitate access to the forest fire area
- b) Fast and intense forest fires are being attacked with multiple tools
- c) Confinement and deceleration actions of fire behaviour
- d) Forest management measures to create prevention infrastructures that can resist forest fires
- e) Training to low- and medium-levels of the organization in order to facilitate decision-making in lower positions of fire extinguishing system
- f) Intense forest treatments in rural-urban interface areas
- g) Monitor extinguishing resources by GPS
- h) Promote operative exchanges with other regions
- i) On-line platforms for continuous learning
- j) Others:

24. Do you think that the SMP methodology is applicable to your territory? YES / NO

25. About fire propagation patterns...

- a) Can be completely applied to my territory
- b) Are based on a reality which is not applicable to my territory
- c) There is a further propagation pattern, which is:

- d) Do not know

26. In general, the relationship of forest structure in my working area to forest fires...

- a) Remains resistant because of human activity developed in it. As an example:
- b) Remain resistant because of natural conditions. As an example:
- c) Do not know

Thank you!